

## ACCOUNTING ASPECTS OF DIGITALIZATION AND INDUSTRY 4.0 IN HUNGARY

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### ABSTRACT

*In our present paper, we analyze the accounting aspects of digitalization and industry 4.0 in Hungary. First of all, the accounting profession is a traditional profession and accounting rules and principles are established and have been the same for many years. However, globalization of business, stronger regulations and numerous technological solutions and innovations are not bypassing the accounting profession, either. Challenges for the accounting profession are reflected in the need for rapid adaptation and transformation of business practice and business processes without abandoning basic accounting rules and principles. The aim of this paper is to analyze and systematize the key challenges that digitalization brings for the accounting profession. The paper seeks to examine how, through environmental accounting, the broader context of corporate sustainability could be incorporated into the developing vision for Industry 4.0, the fourth industrial revolution.*

Keywords: accounting, auditing, bookkeeper-accountant problem

JEL code: O33, M41, M42

### INTRODUCTION

Western civilization has lived in three industrial revolutions so far. In the wake of steam engines and automatization now a brand new, fourth industrial revolution takes place. The essence of this new industrial revolution is that the physical machines and objects all connect to an informational system, while real economy integrates into a huge and intelligent informational system. The Industry 4.0 is such a conception, which reacts to the challenges of the recent revolution, which is mainly conducted through full digitalization of the industrial processes. This is not just about the penetration of technology, but the paradigmatic change of business processes and change of the role of the state. Industry 4.0 is what Hungary and Europe need (*Strange & Zucchella, 2017*).

Joseph Schumpeter's "creative destruction" or Clayton Christensen's "disruptive innovation" is now reaching the accounting, auditing and tax consulting profession. It is not an exaggeration to say that what we experience in our lifetime is as revolutionary as the invention of a humble Franciscan friar, Luca Pacioli's was in the 16<sup>th</sup>

century when double-entry bookkeeping and balance sheets were introduced as we know them today. Maybe today it is not the “what” but the “how” is changing. Accountancy and its functions remain the same but most accountants might disappear sooner than one can imagine. Klaus Schwab says that automation is a substitute for human labour and can create inequalities in the world economy with regard to the labour market. This inequality and disruption can upset the order of creating capital gains and create a gap (Schwab, 2016).

The phrase “Industry 4.0” indicates the fourth industrial revolution. This process will generate the total transformation of our economic life, the strengthening intertexture of informational technology and automatization, and as a result of this, the total revolution of manufacturing processes. With the help of M2M (Machine to Machine), machines will be able to carry out the control of more complex tasks, the basic of which is that they have the ability to communicate with each other with human assistance. The extent of productivity can significantly increase as a result. Automation will be able to cover almost the full spectrum of economic processes. With the help of process automation and machine learning, companies can be transformed into digital companies. Plenty of data also means plenty of analysis opportunities, the Big Data effect means processing and transmitting a huge data set. This is aided by data mining, which helps with the analysis of large amounts of data by discovering and presenting the relationships between the data. The role of automation and decentralized management is increasing, so the importance of production flexibility is growing. Industry 4.0 therefore requires a high degree of variability and flexibility, which increases the complexity of process control (Szóka 2015, 2018; Végvári et al., 2019).

Industry 4.0 refers to the Fourth Industrial Revolution. We consider two multi-dimensional definitions for the 4th Industrial Revolution: Industrie 4.0 is a broad term that encompasses different perspectives, industries, corporate functions, technologies and fields. The experts interviewed in the study considered its holistic conceptual basis to be one of its key strengths. As a rule, the concept has been understood and successfully exported across the globe. Industrie 4.0 serves as an important model for companies around the world for the vertical integration of smart machines, products and production resources into flexible manufacturing systems and their horizontal integration into cross-industry value networks that can be optimized on the basis of different criteria such as cost, availability and resource consumption (Kagermann et al., 2016, p. 19).

Recent concepts such as the Internet of Things, Industrial Internet, Cloud-based Manufacturing and Smart Manufacturing address this vision of future digitally enabled production and are commonly subsumed by the visionary concept of a Fourth Industrial Revolution or Industry 4.0. Lean management as a learning topic clearly dominated the scene in the last decades. However, for future production scenarios in the sense of Industry 4.0 also other competencies need to be addressed that enable future managers and workers of a factory to deal with the challenges of an increasingly digitalized production system (Erol et al., 2016, p. 13).

The breathtakingly fast pace of technological innovation, especially in the field of information technology, will render many of previously revered professionals useless by making their knowledge and techniques obsolete and futile forever. Those who cannot cope with the changing profession will have to seek other employment opportunities or retire from business if they can. If one becomes unskilled despite his or her education he or she might experience his or her situation even worse than it is in reality. It is timely to think now and not to be surprised in the near future.

## **MATERIALS AND METHODS**

In this research we examine the background, the advantages and disadvantages of digitalization with a focus on technologies applicable primarily in accountancy and secondarily in auditing. The data we use here emphasize only partial segments of a more wide ranging research that can be interpreted independently. Certain relationships can also be examined for parts. We have built upon our own research work. We have also used reports from the Hungarian Chamber of Auditors. In the analysis of data survey we could draw a lot of conclusions on how digital development might influence auditing activities and the audit society. Obviously, we do not even try to give a full examination on the effects of digitalization in general, however in the Summary of this paper we draw our more general conclusions as well.

In accordance with the generally accepted rules of international literature, we list the materials under examination and show their object. Since the nature of our work does not allow us to apply extensive statistical methods or calculations because of its ethical aspects, we point out that the work presents representative results. Theoretical work consisted of the conceptual definition and the clarification of the concepts. In the logical system, we included the main definitions of the subject.

## **A BRIEF OVERVIEW OF DIGITALIZATION**

Digital solutions in every walk of life are becoming ever more widespread all around the world. People therefore should adapt to digitalization. In our globalizing world almost no one can avoid the use of new technologies. A lot of people experience this necessity of keeping up with progress as an absolutely crucial condition to remain in business. Digitalization can simplify work routine and be a useful time saving tool for improving efficiency in communication. Gen Y people are already born into this world where the recognition of the importance of IT knowledge is almost given. Older age groups have to cope with the challenge of learning the new skills (Hegedűs & Nedelka, 2020; Szabó-Szentgróti & Gelencsér, 2018).

It is trivial to say digitalization has a lot of advantages and disadvantages as well what prospective users must consider on their own to find how they can find its optimal applications suitable for them. For instance, e-mail replaces conventional postal services, electronic signature and smart contracts make paper contracts with several required signatures obsolete, mobile wallets can organize our vouchers and even our

checkbook money to handle payments. There are software solutions for sending and receiving invoices. Using OCR (optical character recognition) we can digitize incoming paper invoices without human intervention. The AI based system recognizes text via photo or scanning and send it directly to the accounting program: one no longer has to enter and organize data manually.

We might soon arrive in a world that will be eventually paperless. Organization of work, revision of processes and seeking for weaknesses in control points increases a firm's responsiveness to the changing business environment. Since digital processes can be easily tracked, this might play a role in "bleaching" the economy as governments can enforce regulations more effectively – this can increase their tax revenue as well (Ambrus & Széles, 2017). Digitalization can reduce the workload of employees by making them faster in performing their tasks. This increased efficiency can result also in cost reduction, since the more administrative or bureaucratic work become paperless the less resources they use up (Tusnádi, 2018). Dynamic technological innovation in healthcare can be a driving force in global social development, in the reformation of healthcare systems and in the reconsideration of its financing and efficiency issues (Hegedűs, 2017).

Digital development also carries several risks, so it is essential to develop data protection and IT security solution along with those to be protected. Jobs and whole professions can also disappear due to technological innovation and this may result in millions of individuals and families who cannot adapt to an immensely unfavorable situation. These disadvantages, however, can be largely offset by retraining for the newly appearing jobs. Of course, we should recognize that not everyone is receptive to new knowledge. Their presence can hinder the economy in working properly, stably and well.

In 2016 GKI Digital conducted a research on the advantages of digitalization. Respondents had to name factors they regarded advantageous in digitalization. Most of them emphasized better traceability of processes in the first place. Secondarily, they mentioned efficiency increases and better operational reliability. These factors are also important for accounting professionals. *Figure 1* shows the results which point to the fact that energy efficiency is not considered among the most important ones – only 37% of the respondents thought it to be essential (GKI, 2016).

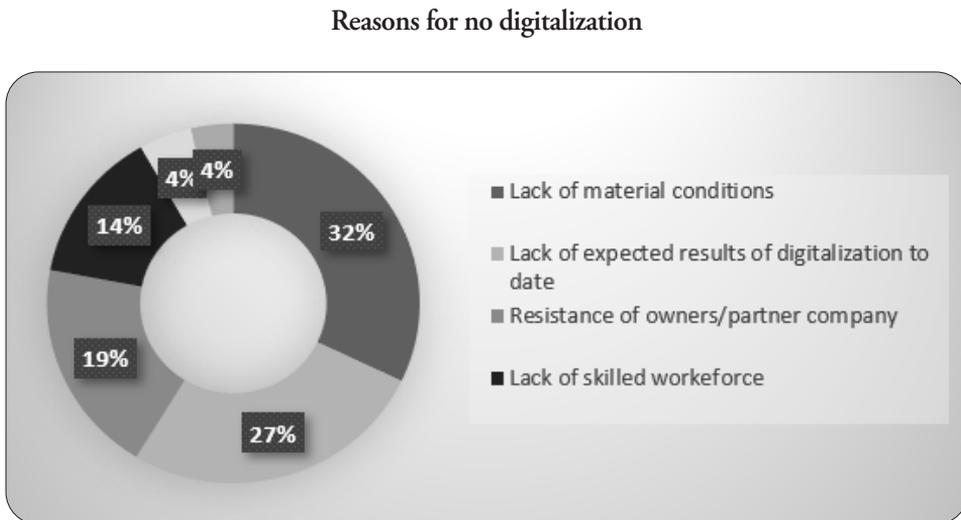
This 2016 GKI research outlines six arguments, as shown in *Figure 2*, put forward by respondents explaining why they lack digital development. 35% of them said the reason why they did not opt for digital solutions was that it required significant financial investment. 29% of them said that their experiences with digitalization did not meet their expectations for it – it either remained unfulfilled or lagged. Some organizations do not introduce digital solutions because they are facing resistance on behalf of their owners or their parent company. As it has been already stated, there is also not enough employable labor force. 9% of respondents blamed inflexibility and the absence of infrastructure for lacking digitalization in their organizations.

Figure 1



Source: Based on *GKI*, 2016

Figure 2



Source: Based on *GKI*, 2016

It is characteristic of digital development that many people simply do not believe in them. They have doubts about them for their slow spreading in the lower phase

of growth. However, there is a point where growth suddenly jumps up by leaps and bounds. Compared to linear growth, it starts to grow at an unimaginably higher rate, than destroys or, better said disrupts, everything around it.

One of the most significant conflicts in the 21st century that we need to talk about is the absence of digital labor force, because there is a significant demand for those professionals who have digital knowledge and whose knowledge about digital devices is adequate (or at least not out-of-date). This supply is lagging. Today's knowledge may not be worthy tomorrow, therefore professionals in this segment need constant and continuous learning and development. However, not every user can make the change in this "comfortable world" at the right place (*Halmosi, 2018*).

Automation reduces the amount of live work, but not the wage bill, more skilled, better paid work comes to the fore. For example, the Hungarian tax system has rightly shifted towards sales taxes, because it encourages individual work performance, and on the other hand, even if the labour input is really significantly lower, the state will still have enough revenue. This trend has also been supported by tax benefits and subsidies, with the intended purpose of encouraging household spending, and thus to increase governmental revenues from sales taxes (*Sági et al., 2017*). In addition, by broadening the circle of taxpayers (burden sharing), advanced technology operators, who are now in the forefront of being taxed, will become revenue generators for the state (*Lentner, 2017*). The reform of the tax system in Hungary after the crisis of 2008 showed an effort to reduce the tax burden on labour. In the period of 2004-2015, there were two different cycles: the first cycle was between 2004 and 2008, when the rate of labour taxes was increasing, and the rate of consumption taxes was decreasing. At that time, however, the trend was reversed and it was clear from 2009 to 2015 that the proportion of sales-to-consumption taxes rose from around 36% in 2008 to 45-46%, while the proportion of labour taxes rose to 52% in 2008 from around 45-46% of total tax revenue by the end of the period (*Varga, 2017*).

Our research shows that the main benefit according to the respondents is that processes become visually more traceable, and the rational use of new technologies can lead to increasing efficiency and cost reduction. Disappearing jobs can badly affect those who will lose employment in decades to come because they insisted on doing well-trained working processes. Naturally, some job tasks will be performed by digital technologies. These will require new employees in order to discover, develop and apply them. Constant changes also indicate that the digitalization of processes is not an overnight phenomenon, though it happens rapidly. It will require constant and continuous training and retraining in order to keep employees in the labor market, even those who are members of previous generations and do not deal with digital solutions so frequently.

## **THE TRANSFORMATION OF ACCOUNTING**

It is a common experience to everybody involved in accounting that the profession is undergoing a profound change. We see how applications of artificial intelligence

make data recording ever faster (Kokina & Davenport, 2017). Certain accounting documents are no longer printed but their data is transferred directly to the accounting software between interconnected databases.

For example, not that long time ago, printed bank statements were delivered to the accounting firm by mail that took days. The accounting firm's specialist employees entered the data into an accounting software manually, which was a time consuming chore for office workers. Now they are loaded automatically into the accounting software's bank logs in a blink of an eye.

Not so long ago transactions on the bank account were sorted out and recorded by bookkeepers in a seemingly never ending process. The most common bank transactions are trade accounts receivables and payables. Sorting them out and interconnect them by hand from analytics is again a time consuming chore (*Ligeti et al.*, 2019).

Nowadays, it is easy to code computer programs that can replace human labor in this process very efficiently. These business algorithms can perform these tasks in a much shorter time and with much fewer mistakes than bookkeepers ever could.

We might think that human labor is no longer needed for them, but that would be a mistake. For centuries from the invention of double-entry bookkeeping by the Italian Franciscan friar Luca Pacioli there were no computers at all. Data was handwritten by bookkeepers into the books of the firm. With the advent of the computer, there was a huge change in the profession, as it was no longer necessary to write analytics in books by pen and compile a general ledger with an unimaginable amount of analytics. Even rudimentary accounting software could easily replace human labor. This development started to happen only 60-70 years ago, yet neither the bookkeeper nor the accountant profession disappeared – they only changed (*Tóth & Széles*, 2019).

In our view the industry 4.0 revolution will bring about a similar transformation but not any destruction. No business activity will cease that creates value. We can feel that our well-known processes are turned upside down and inside out and therefore we are experiencing a crisis, but we should not forget that in Japanese script the word "crisis" is indicated by two punctuations: one meaning danger, the other meaning chance. We should rather focus our attention on what opportunities we can discover and then exploit in this inevitable change hitting the accounting profession.

The impact of the industry 4.0 revolution may affect the bookkeepers' work more than that of the accountant. Bookkeeping can be almost entirely automatized, but well-trained accountants will always be in dire need by businesses. National accounting systems are ever more complemented with IFRS that require more specialized accounting work. While a Hungarian financial statement comprises of three parts (balance sheet, income statement and notes), an IFRS financial statement is made up of five (balance sheet, comprehensive income statement, statement of change in equity, cash flow statement, notes). In addition to that, IFRS financial statements require more labor year round, and not just when they must be prepared. This work must be done by accountants.

## **THE THEORETICAL PROBLEM OF THE DIFFERENCE BETWEEN ACCOUNTANTS AND BOOKKEEPERS**

In 1494 the Franciscan friar Luca Pacioli published his Summary of arithmetic, geometry, proportions and proportionality. In this monumental work he describes the logic of double-entry bookkeeping. The procedures themselves changed a lot over the centuries but the logic remained the same.

The basic idea of double-entry bookkeeping is that cash flow (Cash basis accounting) and fulfillments (Accrual accounting) are different. The bookkeeper is someone who knows the techniques of this aforementioned logic and applies them to actual bookkeeping. This work can be summarized as follows:

- books have two pages: debit and credit
- assets and expenses appear on the debit side, while equity, liabilities and revenue appear on the demand side
- if a sum is recorded on either side, it must be recorded on the other as well to maintain balance
- revenue and expenses must be combined and their balance transferred to equity as a result
- on the balance sheet turning date in the current year it is closed and reopened with the same values for the following fiscal year.

From the description of the mechanism of double-entry bookkeeping, we can see with our eyes today that this can now be easily programmed, no bookkeeper is required. Much more, the process requires IT professionals who understand how the system works and can program the necessary processes and oversee the proper running of the programs. The work of bookkeepers described above is being largely taken over by artificial intelligence as a result of industry 4.0 (*Tiwari & Khan, 2020*).

The accountant is familiar with the legal rules, which are designed to determine the income of the company as accurately as possible, to show a reliable and true picture of the assets on the balance sheet date. Statutory rules or accounting principles (US GAAP, IFRS, etc.) set out procedures that do not follow the logic of double-entry bookkeeping, but serve to ensure that market participants base their decisions on reliable financial statements (*Sangster, 2018*). For example, if a company has 400 kg of goods worth 120 EUR / kg. He buys an additional 600 kg of goods for 110 EUR / kg. He sells half of the goods to a customer at a price of 200 EUR / kg with a 30-day payment deadline in the middle of the year. Within two weeks of the balance sheet date, the company becomes aware that liquidation proceedings have been initiated against the buyer and, according to the liquidator, there is no chance of settling the claim (*Table 1*)

It is clear from the example that with the bookkeeper mechanism, the corporate income in the transaction is a profit of EUR 41,000 and a trade receivable of EUR 100,000 in the balance sheet. According to the accountant, the corporate result on the transaction is a loss of EUR 59,000 and no trade receivable is recognized in the

balance sheet. It is clear that the work of an accountant is essential in the course of corporate work.

**Table 1**

**The work of accountant vs bookkeeper**

bookkeeper replaced by artificial intelligence	accountant
purchase of goods Db Goods – Cr Liability 600 kg x 110 EUR/kg = 66.000 EUR	
	The inventory valuation procedure needs to be defined by the accountant. In this case, it reduces its stocks from the warehouse according to the FIFO method.
goods sales revenue accounting Db Trade receivables – Cr Revenue 500 kg x 200 EUR/kg = 100.000 EUR	
	Revaluation of the result according to the information known to the balance sheet: Db Direct expense – Cr Trade receivables 100.000 EUR

**THE IMPACT OF DIGITALIZATION ON ACCOUNTING AND TAX SYSTEMS**

Conferences and retrainings in 2019 were preoccupied with the big question: what will digitalization bring to accountancy and auditing? Can we really rely on scanned or photographed documents handled by artificial intelligence without human intervention? How will their accounting be done by a mere software? Will accounting be reduced to digital transfers between programs? Could IT solutions take over the role of accountants? If yes, how much? Will record analysis be easier if we implement Receipt Bank, 1tap receipts, SMACC, SDSYs or other systems? Will the intuitive work of bookkeeping be completely replaced by process control based on mathematical formulas which no longer require human work?

These questions can be answered from many perspectives, but all depend on the accounting and tax systems as well as the structure and business environment of SME sectors in respective countries. Governments are primarily interested in increasing – or at least maintaining – their tax revenues, so there is already a simplified accounting system that we can boldly call tax accounting (e.g. in Hungary there are “EVA”, “KIVA” and “KATA” – a simplified corporate tax, a small business tax and a small payer’s lump sum tax, by which the government adjusts tax revenues to some kind of index while marginalizes the role of conventional financial accounting).

This simplification has several disadvantages. A lot of them are even threatening.

They make it difficult to determine the property, income and efficiency of microenterprises from aggregated data without additional annexes, since a lot of data important for such an evaluation are lost or not even presented.

The structure of the SME sector in Hungary shows an extremely distorted picture due to their numerosity, capital strength, responsiveness, technical level and number of employees. We can discuss their efficiency only with due caution, unbiased from the preferences they might acknowledge as an indicator of marketability (Sági, 2017). In many countries the development of the SME sector and the improvement of financial and accounting knowledge on the level of entrepreneurs would be necessary for development. Such a development could be accompanied by the development of the ethical behavior of entrepreneurs. Any small shift in morality could be measured in terms of tax revenue. Coercive means are always bad. This recognition can lead Eastern European countries to a right direction (Hegedűs & Nedelka, 2020).

Simplification of accounting and tax systems combined with increased control seem to be the only way to improve predictability and tax revenue levels (Hegedűs, 2019). This reshaping of current tax and accounting systems should serve the elimination of structural distortions which favor one interest group over another. Digitalization makes the economy more transparent, government control more efficient and gives it the ability to filter out unreal economic events. We can get rid of the underground economy, track cross-border services and transform accounting systems by making use of digital technologies. Auditing and accounting will also be transformed with the development of digitalization which will result in new methods, simplification and real-time measurement.

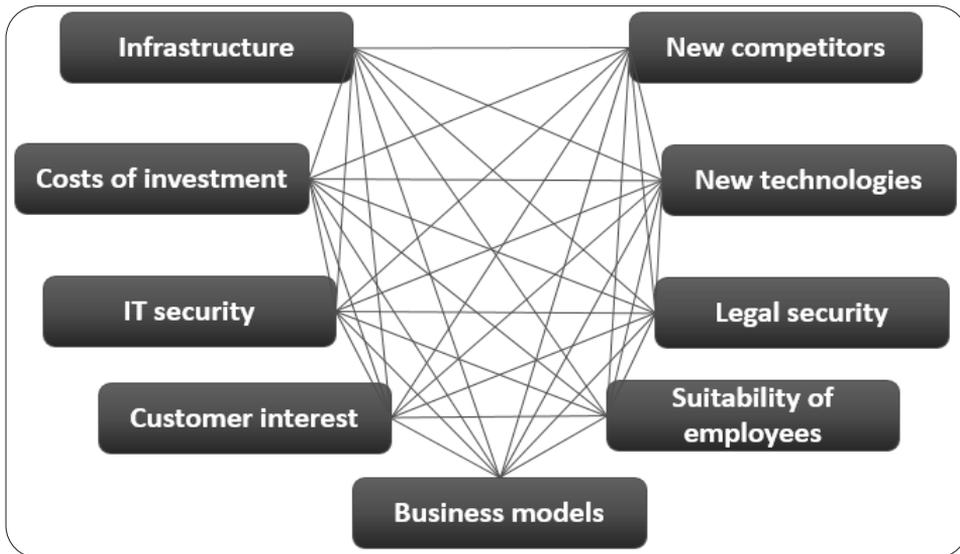
We must cope with the challenge we face by new digital solutions. Otherwise their imperfect implementation will result in inefficiency and new technologies will not work well – especially not in our favour. Whatever the level of investment will be, we should make it and take their long run returns into consideration from the very beginning. Inevitably the parallel creation of IT security solutions and further clarification of GDPR issues are crucial (Jósvai, 2018).

Data protection in the digital world is of primary importance in accounting. While we are eager to further technological innovation, we should also constantly check whether employees who are expected to use new technologies can perform this task or not – they might need further training or we should lay them off and hire new staff. All these measures require careful consideration, as they keep us competitive. The connection points between digitization and the industry 4.0. are illustrated in *Figure 3*.

The Future of Jobs study published by the World Economic Forum in 2016 predicts that the possibility of disappearance of accountants by 2025 is 98%. The study emphasizes that significant part of bookkeeping is just a routine and which are mostly automated. Controlling represents higher added value which can be more difficult replaced by robotic solutions, but due to the development of artificial intelligence, these workflows are also not protected from automatization (*World Economic Forum, 2016*).

Figure 3

Challenges of digitalization and Industry 4.0



Source: Based on [http://industry4.hu/images/cikk\\_kepek/ipar4\\_kihivasai.png](http://industry4.hu/images/cikk_kepek/ipar4_kihivasai.png)

In the future we will do the bookkeeping and auditing service in a different way (Kovács & Kovács, 2017). Thanks to automatization and digitalization we will most probably be able to save considerable time and human resources, the output of the work done will be visually more attractive and better, and we can increase efficiency, too. We will save time on different testing tasks, make reports automatized and always available. With the help of automated software, the large and often non-similar data can be processed, and then they can be interpreted in a more digestible, visualizable form. A paperless office, electronic filing systems, digital signatures can be realized, which reduce invested human work or make knowledge of processes faster. Reporting becomes simpler, authorities can get information about financial-administrative activities of companies simultaneously with carrying out of processes as a result of automatization and this might make intervention more effective. Such accounting and taxation solutions gain ground which strive for unified ones without borders (IFRS) (Kenyeres et al., 2016).

## CONCLUSIONS

In the accounting and auditing profession we are also in the age of digitalization, which has a significant impact on our work. If we want to be successful in our job and want to perform it efficiently, then we have no choice but to keep up with the trends of artificial intelligence and automatization. The accounting-auditing profession is suitable for highly educated and skilled professionals who are willing to cons-

tantly adapt to the changing world. Accounting data is being digitized. If more and more people are talking about its impact, their skepticism about or even fear of it is normal and acceptable. Automatization and artificial intelligence are surrounded by a constant paradox, digital technologies transform previously known frameworks. Digitalization will have a decisive impact as the pace of information expansion and of calculations will match the computing capacity of computers. This capacity – according to Moore’s law – will grow exponentially. However, exponential growth can be deceptive, estimating future effects can only be done with correct correction.

We can conclude that the named item expenditure is a sign of the fact that Hungarian legislation recognized the significance of the fourth industrial revolution. The effect of the fourth industrial revolution on live labour and the structure of labour market is unquestionable. However, Hungarian accounting closely follows the central measures of the EU and the developed western world.

It is necessary to recognize and apply changes because this is a basic requirement in the accelerating and ever-changing 21<sup>st</sup> century. We cannot reduce the pace of change, we can only ignore it, but in turn, it may result in a deserved loss of market or employment. Bookkeeping and auditing will not disappear in the coming decades. Without accounting there is no controlling and without knowledge about the past, the future can only be determined based on estimation or prediction.

Audit remained what it was. It is and will be about to increase confidence for financial statements and to improve the quality and reliability of information provided by annual reports. Accountancy and tax consultancy provide high quality added value by supporting customers in achieving their goals.

Artificial intelligence can analyze risks, set up and apply mathematical models. People will have to compete with smart machines someday but behind the machines there will always be people who build and train them. Only human beings can coordinate human intuitions, intelligence, thinking, organizational skills and many other aspects, therefore human resources will always be needed.

## **ACKNOWLEDGEMENT**

„Supported by the ÚNKP-20-3-I-NKE-140 New National Excellence Program of the Ministry for Innovation and Technology from the source of the National Research, Development and Innovation Fund.”

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